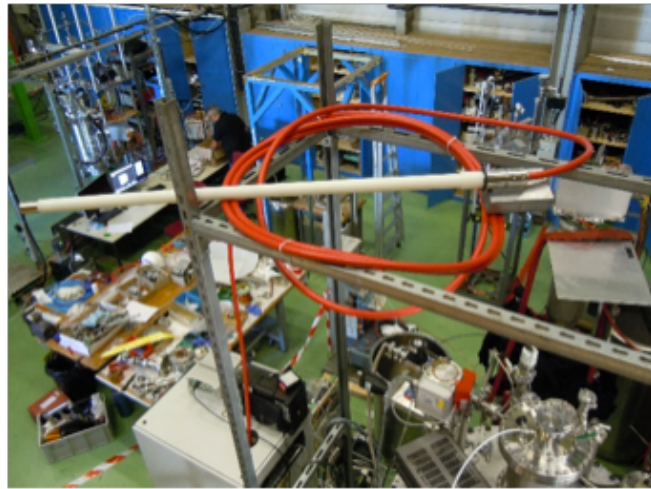


Design and performance of a  
**300 kV high voltage**  
**feedthrough for LAr TPCs**

ETHZ

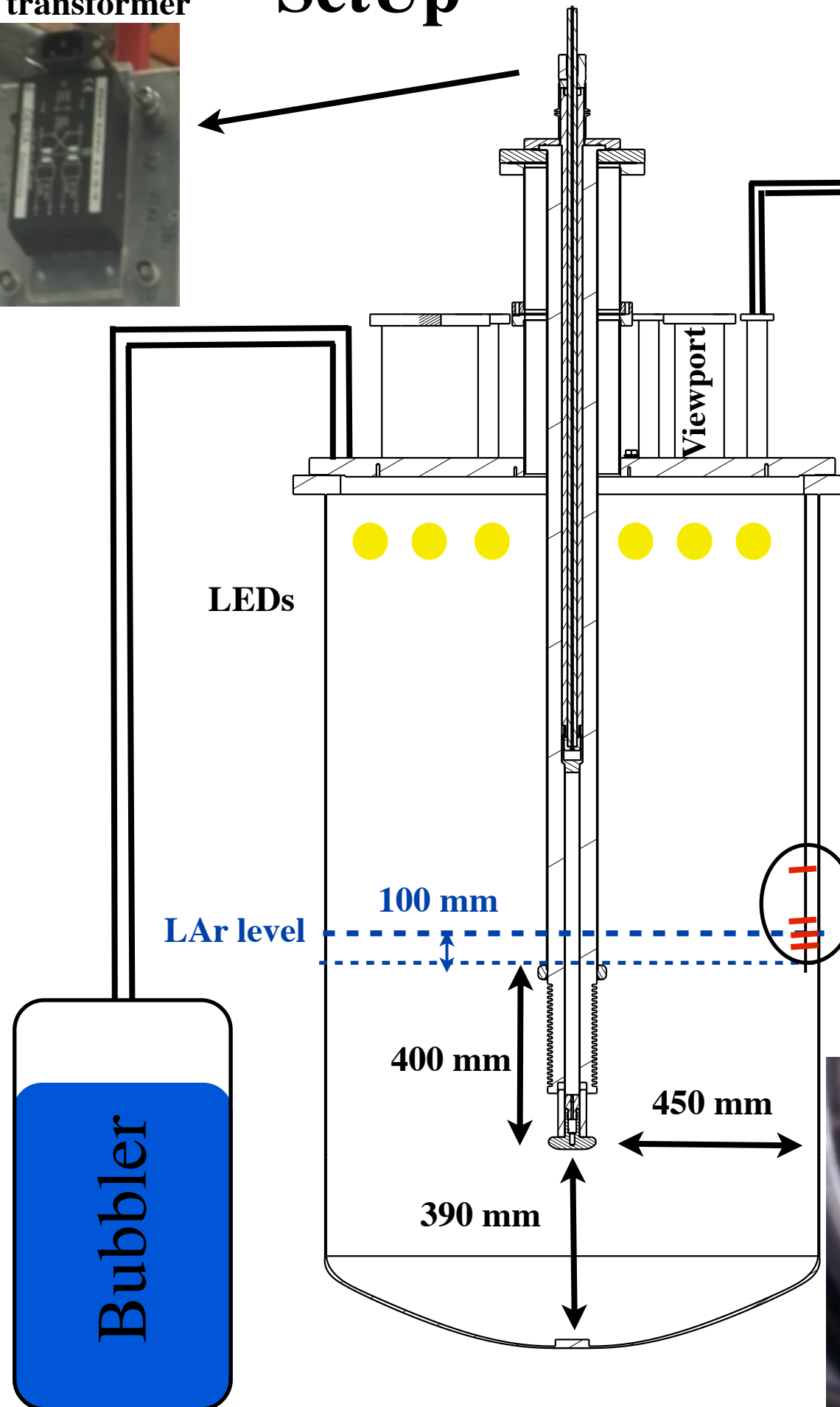
HV cable



1:1 transformer



# SetUp



**O<sub>2</sub> impurities  
gas analyzer**  
precision  
 $\pm 100$  ppb

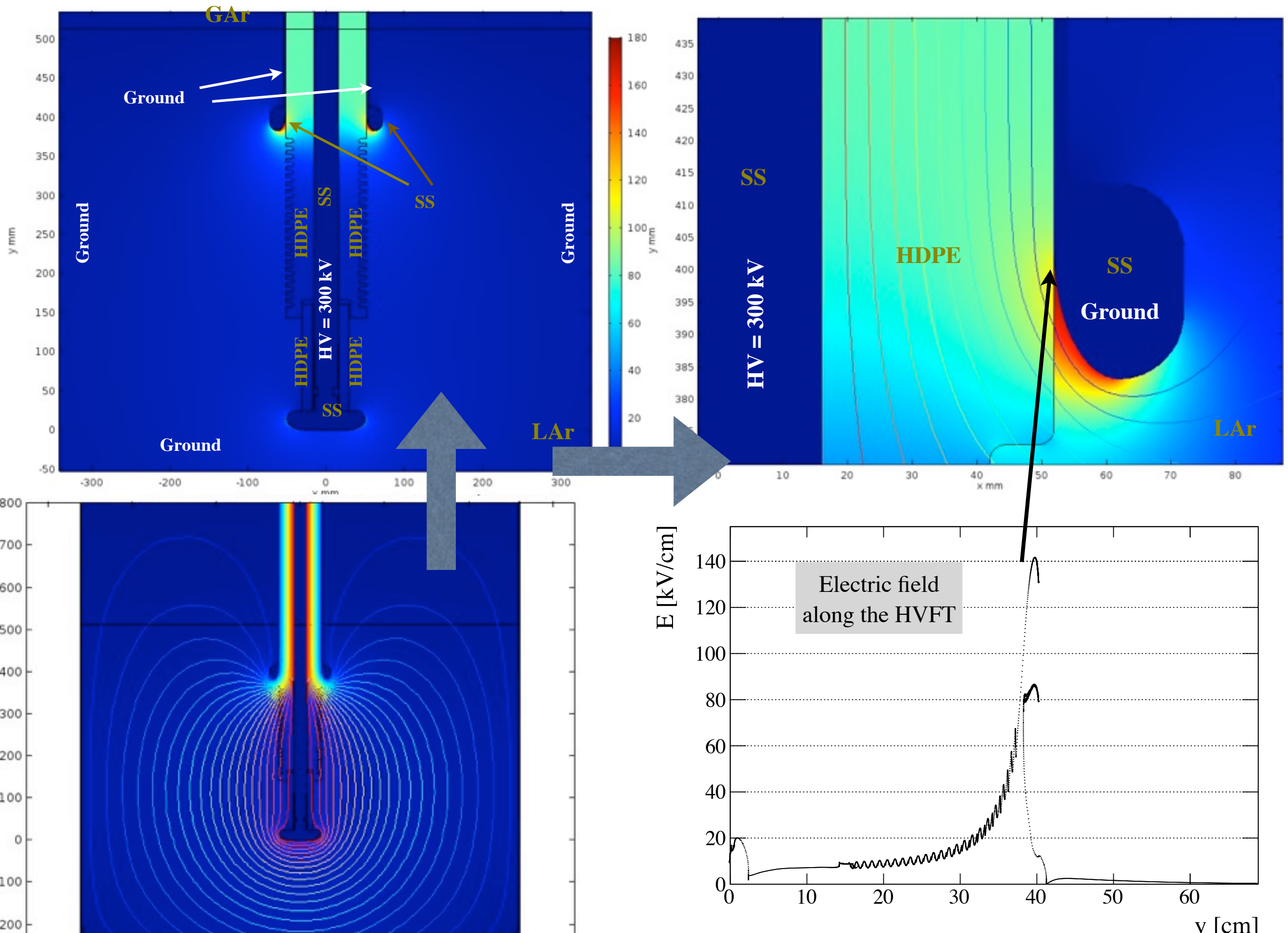
O<sub>2</sub> impurities measured in the  
gas were less than 0.1ppm.

**Temperature  
sensors**  
100 mm  
10 mm  
10 mm

The pressure in the LAr was  
very stable at 1.05 bar.

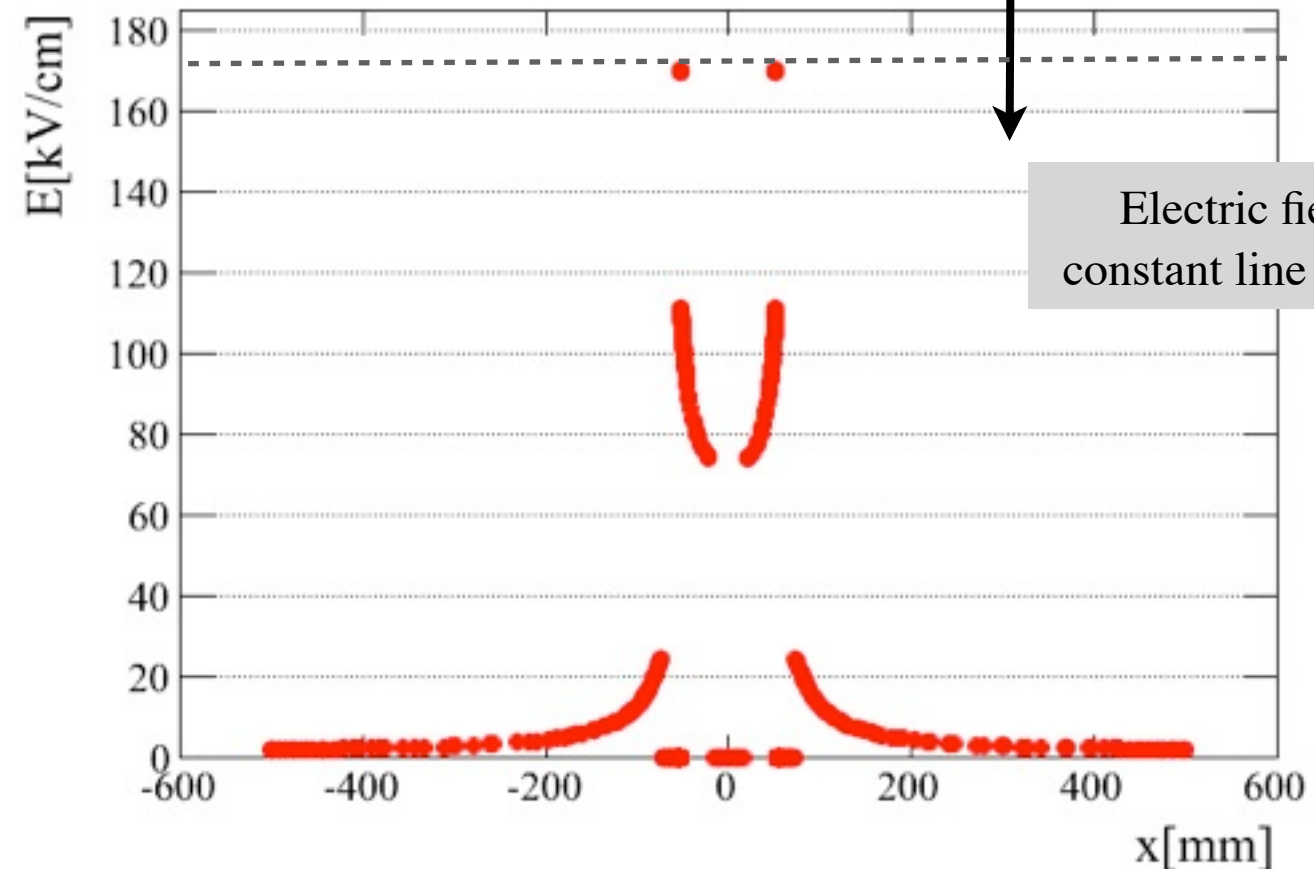
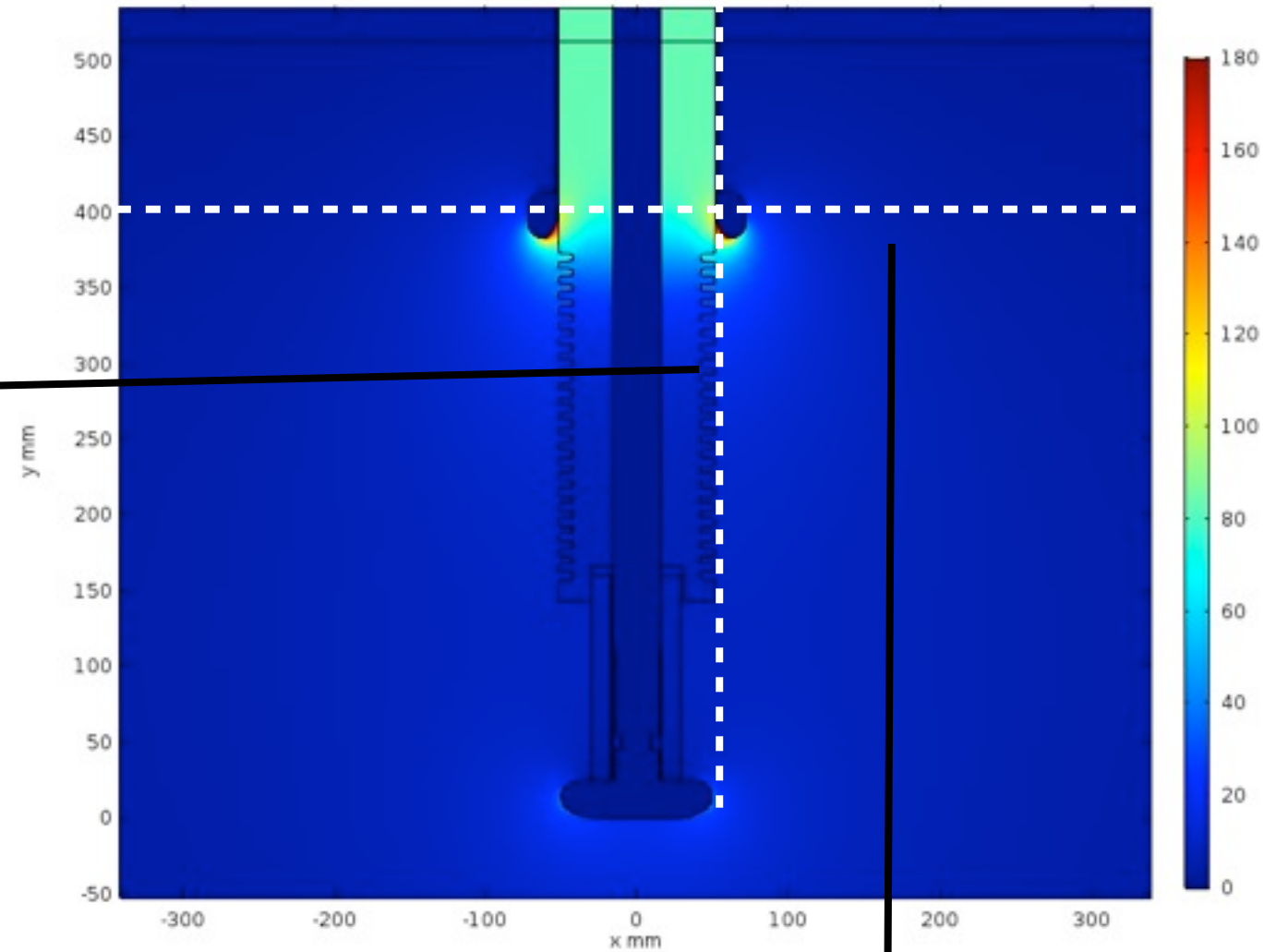
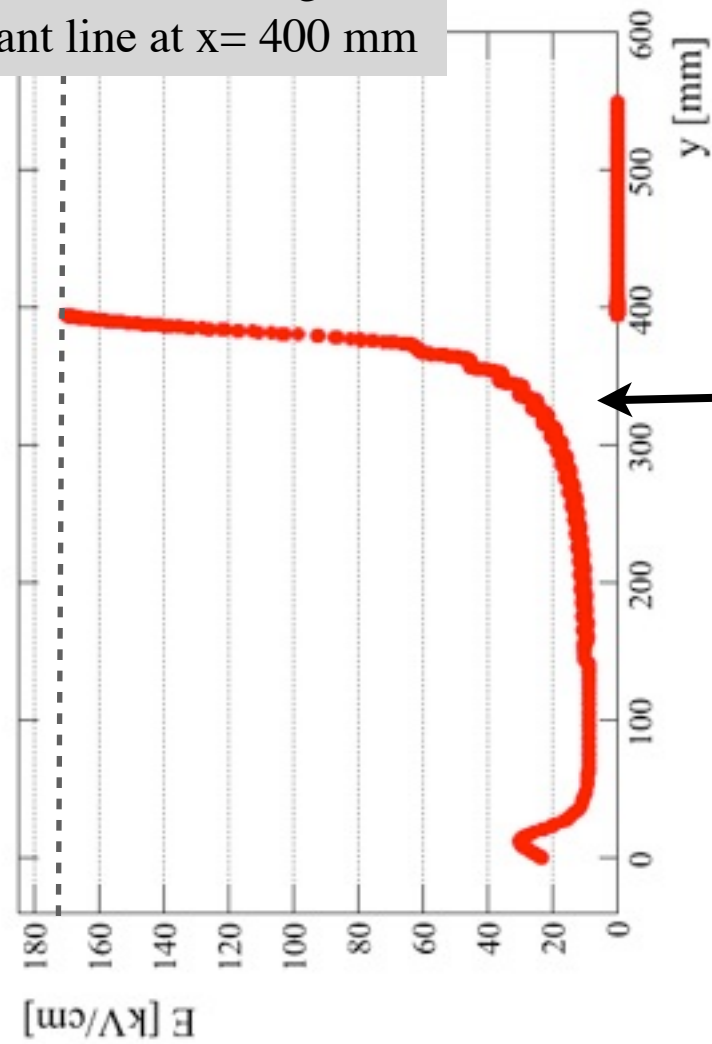


# Simulations



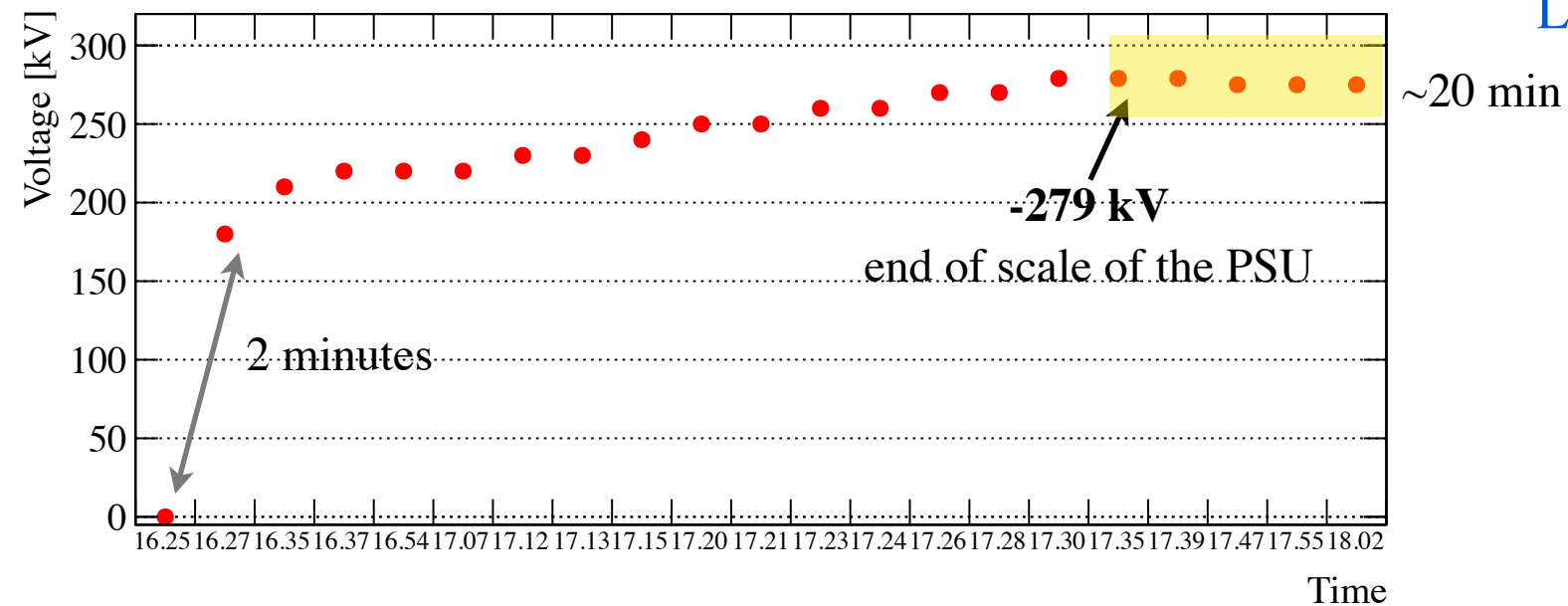


Electric field along a  
constant line at  $x = 400$  mm

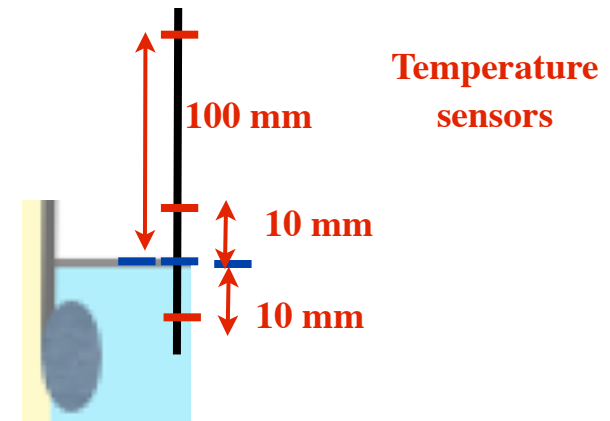


Electric field along a  
constant line at  $y = 53$  mm

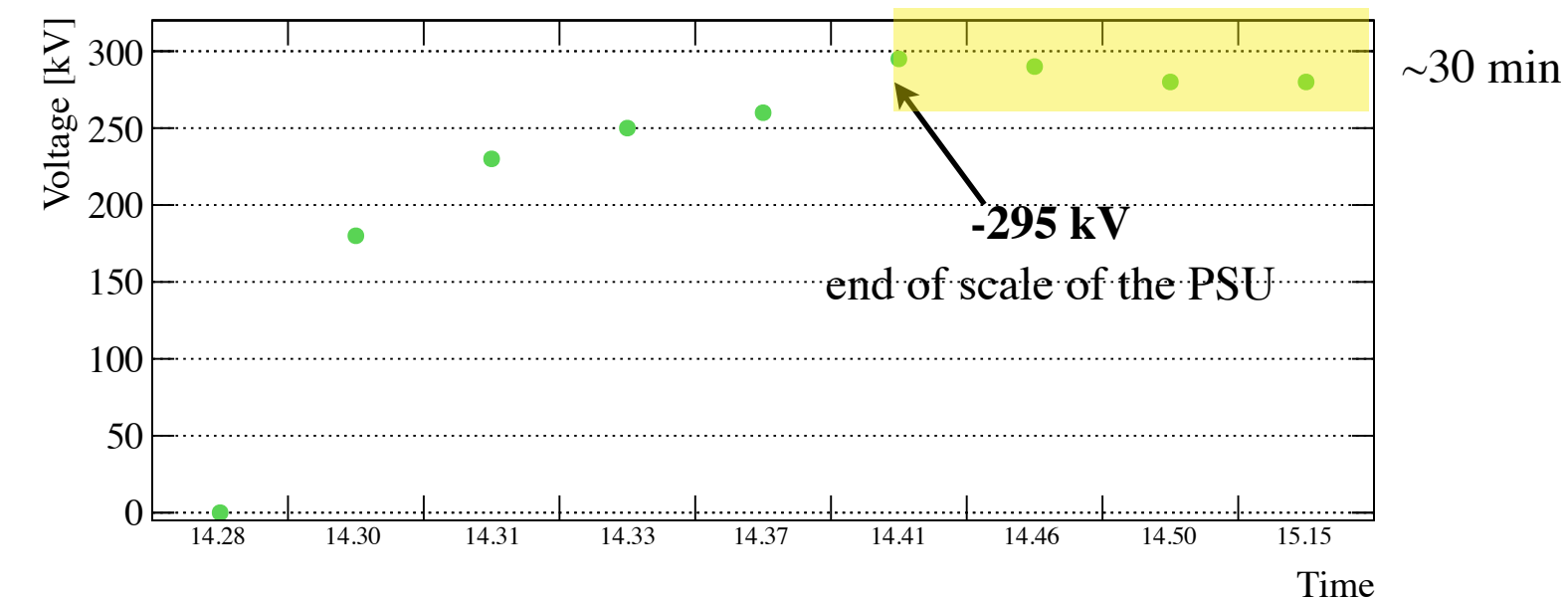
# High Voltage feedthrough test



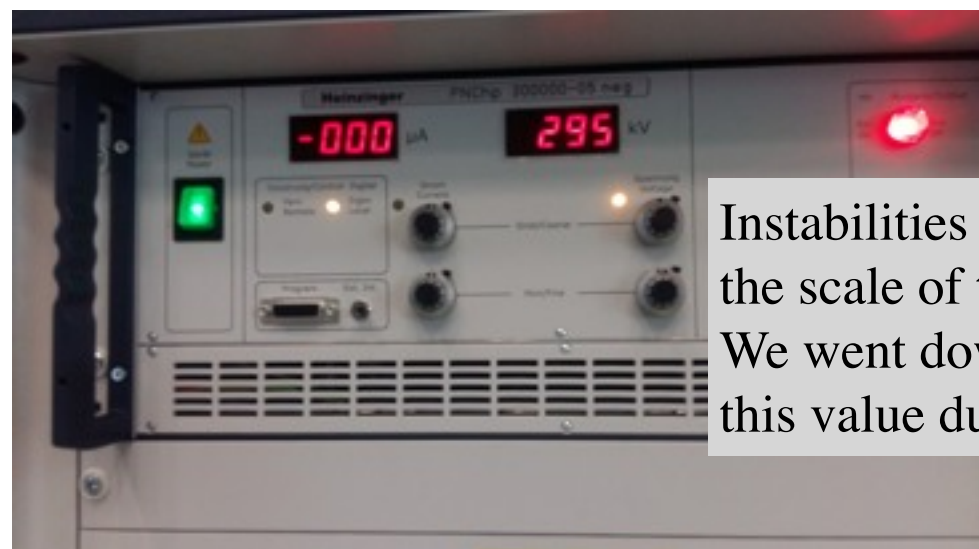
LAr level at the nominal value



LAr level at 10 cm above the nominal value



At this level, we observed bubbles coming from the HVFT. They were present even without any HV and without the HV cable connected. It is due to a heat input under investigation.



Instabilities in the voltage at the end of the scale of the PSU.  
We went down to 280 kV and we kept this value during half an hour.



# High Voltage feedthrough test

“Long-term tests” letting different voltages during **one hour**

LAr level at 10 cm above the nominal value in all cases

At this level, we observed bubbles coming from the HVFT. They were present even without any HV and without the HV cable connected.

Voltage [kV]	Stability	Electric field at the critical point [kV/cm]
-275	Voltage stable but small current fluctuations between 0 and 2uA in the display of the PSU	56,5
-250	Voltage stable but small current fluctuations between 0 and 2uA in the display of the PSU	142
-100	Voltage stable	156

# Conclusions

Preliminar test to confirm:

- Stable operation of the HVFT in the 3x1x1 at -50 kV (eventually up to -100kV).
- The HVFT was able to provide the maximum voltage given by the PSU inside LAr.
- Heat input from the HVFT (under study) and small discharges due to the presence of bubbles (for a larger voltage such as -250 kV).